Plant Seedling Identification Using CNN

Problem Statement:

The target of this project is to distinguish between weed seedling and crop seedling of 12 different plant species. It will help the farmers to identify unwanted plants from field.

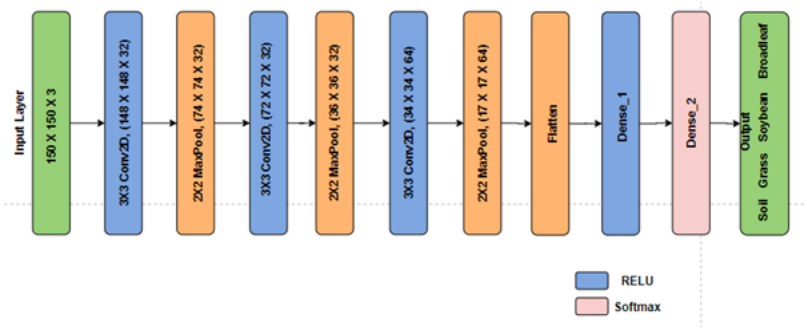
Background:

Weeds are the unwanted plants that grow with main crops and compete for water and nutrients. Sometimes we may not be able to differentiate weeds and normal crops.The traditional methods of weed removal are time consuming and hence it will be more useful if we automate this process. So, this paper proposes a system to process high-resolution farm images taken from drones in order to detect and distinguish weeds from crops. Here the classification of weeds and crops was experimented with two convolution models : Conv2D (a custom build model) , vgg16 (a classic convolution model).The architecture of the model and the model parameters are fine-tuned to get the best possible accuracy. Finally weeds are identified among the four classes so that it will be easy to pluck the weeds from the fields. Hence, by leveraging the use of technology for farmers, it would eventually lead to the reduction of workload and improvement of agricultural output.

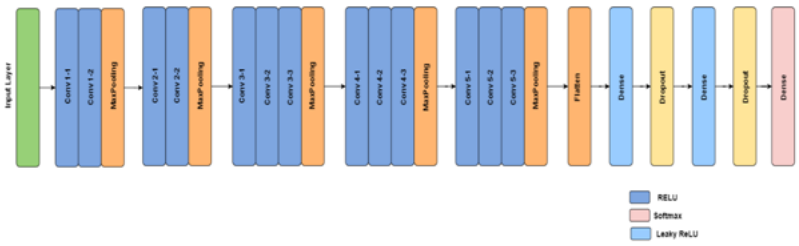
Methodology:

For this purpose we have used two CNN models. The first one is build from scratch layer-by-layer called Conv2D model and the second CNN model is the classic VGG16 model. A comparison has been made between the two outputs on the basis of accuracy.

First model



Second model



Experimental Design

Dataset:

We have used a dataset called plant-seedlings-classification from Kaggle. It has approximately 4764 images, categorized into 12 classes i.e. 12 plant species. These images are in RGB format. The plants represented are in various stages of growth. (https://www.kaggle.com/c/plant-seedlings-classification).

Evaluation Measures:

Evaluation is measured in terms of SENSTIVITY, SPECIFICITY, ACCURACY, Mean Square Error.

Software and Hardware Requirements:

Python based Computer Vision and Deep Learning libraries will be exploited for the development and experimentation of the project. Tools such as Anaconda Python, and libraries such as OpenCV, Tensorflow, and Keras will be utilized for this process. Training will be conducted on NVIDIA GPUs for training the Feed-forward backprop neural network for plant identification images.